SHRIMP zircon geochronology of the Emeishan Large Igneous Province (SW China): implications for double mass extinctions in Late Permian M.-F. Zhou[1], J. Malpas[1], X.-Y. Song[1], P. T. Robinson[1], A. K. Kennedy[1], M. Sun[1], G. Thompson[1], D.-P. Yan[1], and C.-J. Zhang[1]. [1]Department of Earth Sciences, University of Hong Kong, Hong Kong, China; [2]Department of Applied Physics, Curtin University of Technology, Perth, Australia; [3]Chendu University of Technology, Chengdu, China

It is well documented that the Siberian Traps erupted at the end of the Permian at 251Ma [1,2]. Eruption of the voluminous Emeishan flood basalts (EFB) in SW China was also previously thought to be the source of the Permo-Triassic (P/T) boundary volcanic layer in the Meishan section, Zhejiang Province, China[3]. The precise age dating of the EFB is thus important in the context of the relationship of events at the time of the Late Permian or P/T boundary.

The Emeishan Large Igneous Province is represented by voluminous flood basalts and synchronous mafic intrusions which are considered as feeders. The Emeishan volcanic succession covers an area of more than $5x10^5$ km^2 with thicknesses ranging from several hundred meters up to 5 km. In the western part of the province, the volcanic succession was strongly deformed, uplifted and eroded as a result of the India-Eurasia collision. Several N-S trending faults in the Yuanmiao-Xichuan region have exposed Emeishan dykes over a considerable range of crystallization depths. The feeders intrude various lithologies in the region and are the hosts of major ore deposits, e.g., V-Ti-magnetite deposits and Ni-Cu-(PGE) sulfide deposits. New SHRIMP zircon dating results reveal that the igneous activity is older than previously thought. Two Ni-Cu-(PGE)-bearing, peridotite-gabbro intrusions, the Xinjie and Zhubu intrusions, have crystallization ages of 258.7 +/- 1.5 Ma, and 256.0 +/- 1.0 Ma, respectively. These new dates are consistent with observations that the basalts are overlain by the Xuanwei Formation below the the Permo-Triassic (P/T) boundary layer.

Stanley and Yang (1994)[4] find two peaks in the rates of extinction, one at the end of the Guadalupian (approximately 258 Ma), and another 8 Ma later, at the end of the Tatarian, i.e., the Permo-Triassic boundary proper. Holser and Magaritz (1987)[5] had already pointed out two sharp minima of sea level at these two times. Based on their literature reviews, Courtilllot et al. (1999)[6] proposed that the EFB was erupted at the end of the Guadalupian, causing the earlier one of the two phases of mass extinction. Our study provides the first direct evidence of a temporal relationship between eruption of the EFB and the mass extinction at 258 Ma and supports the idea of a causal relationship. Our results clearly rule out a temporal coincidence between the EFB and the mass extinction episode at the P/T boundary and support the suggestion that there are two extinction events in Late Permian: one at the P/T boundary and the other one slightly (about 5 to 8 m.y.) earlier.

REFERENCES:

[1] Renne PR., et al., 1995, Science 269, 1413-1416; [2] Kamo SL., et al., 1996, Geochimica et Cosmochimica Acta, 60, 3505-3511; [3] Chung SL., and Jahn BM., 1995, Geology, v.23, 889-892; Stanley SM., and X. Yang, 1994, Science 266, 1340-1344; [5] Holser WT., and Magaritz M., 1987, Modern Geology, 11, 155-180; [6] Courtillot V., et al., 1999, Earth and Planetary Science Letters, 166, 177-195.